

1.0 INTRODUCTION

The U.S. Army Engineering and Support Center, Huntsville (CEHNC), and the U.S. Army Corps of Engineers (USACE), Honolulu District (CEPOH), have teamed to produce this Phase II Engineering Evaluation/Cost Analysis (EE/CA) for the Former Waikoloa Maneuver Area and Nansay Sites, Island of Hawai'i, Hawai'i. This Phase II EE/CA report documents the decision process to determine the most appropriate ordnance and explosives (OE) response actions for the Former Waikoloa Maneuver Area and Nansay Sites. The Phase I EE/CA was conducted by Earth Tech, Inc. (Earth Tech) in 1997 under contract to the CEHNC (Project No. H09HI035901) for 521 acres within six individual investigation areas at the Former Waikoloa Maneuver Area. Results of the Phase I EE/CA investigation are presented in Section 2.3, Previous Investigations.

The results of the OE investigation conducted under the Phase II EE/CA were examined using the Ordnance and Explosives Risk Impact Assessment (OERIA). The OERIA provides a stakeholder-friendly method of risk assessment for use during an EE/CA. OERIA uses direct analysis of site conditions and human issues that evaluate OE risk for a qualitative assessment of OE sites. The qualitative risk assessment follows a very conservative approach and evaluates the level of OE risk to the public in terms of the likelihood of exposure and the severity of exposure to OE. It is important to note that exposure to OE does not indicate that an incident or injury will occur. The person would have to perform some deliberate act, such as digging for the item, picking it up, or striking it, in order to be exposed to actual risk. An evaluation of the risk of OE exposure has been performed for each investigation area at the Former Waikoloa Maneuver Area and Nansay Sites (Chapter 4.0), even if no evidence of OE was recovered during the EE/CA field investigation, because a statistical sample can never prove the absence of OE at a site. A residual risk (no matter how small) will always be present based on past military use of the area.

The Draft Final EE/CA report was issued in September 2001 for public review and comment. Following the public review period (October and November 2001), no comments to the report were received. The CEHNC has approved this Final EE/CA Report and an Action Memorandum will be prepared to document the selected OE response actions for the Former Waikoloa Maneuver Area and Nansay Sites. The USACE, Honolulu District, will maintain a residual responsibility to ensure that implemented OE response actions (Chapter 9.0) are effective in reducing the risk associated with OE by conducting recurring reviews (as outlined in Chapter 10).

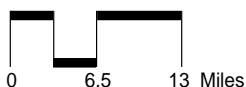
1.1 PROJECT AUTHORIZATION

In 1999, Earth Tech was contracted by the CEHNC (Project No. H09HI035902) to conduct an EE/CA for approximately 110,000 acres of the 123,000-acre Former Waikoloa Maneuver Area and Nansay Sites, Island of Hawai'i, Hawai'i (Figure 1-1).



EXPLANATION

- Phase II EE/CA Investigation Area
- District Boundaries
- ▲ Mountain
- Town
- ⑪ Highway



Basemap Source: GTE Directories Corporation.

Regional Map

Figure 1-1

Approximately 13,000 acres of active military training areas were specifically excluded from investigation during the Phase II EE/CA. Earth Tech contracted with Zonge Research and Engineering (Zonge) of Tucson, Arizona, to provide support for the geophysical data collection, processing, and analysis tasks of the Phase II EE/CA investigation. Earth Tech contracted with Donaldson Enterprises, Inc. (DEI), to provide support for intrusive OE sampling and unexploded ordnance (UXO) demolition activities during the Phase II EE/CA field investigation.

1.2 EE/CA PURPOSE AND SCOPE

The purpose of the EE/CA is to evaluate potential ordnance risk and develop OE response action alternatives that reduce the risk associated with OE at the Former Waikoloa Maneuver Area and Nansay Sites. The scope of the EE/CA is limited to the evaluation of risk to human safety associated only with the explosive hazards of OE.

The future development and use of the Former Waikoloa Maneuver Area and Nansay Sites has a direct influence on the life and livelihood of several stakeholders including the public; landowners or those with a financial or business interest; and many federal, state, and local agencies. This EE/CA report includes consideration of the concerns of the stakeholders involved. Once the EE/CA has been completed, new information and discoveries will be evaluated by the USACE, Honolulu District, by means of recurring reviews (as outlined in Chapter 10).

For this process to be successful, close coordination and cooperation between the stakeholders, community, regulators, and technical support personnel must occur. In serving as a cornerstone for the risk management effort, this EE/CA report identifies and evaluates reasonable alternatives and makes recommendations for OE response actions, where appropriate.

This EE/CA report documents the background, approach, and evaluation process for determining the potential risk that OE poses to the public at the Former Waikoloa Maneuver Area and Nansay Sites. It also summarizes field activities and outlines recommendations for future OE response actions based on the methodology described in this document.

Four OE response action alternatives are identified and evaluated in this EE/CA report. These include No Action Indicated (NAI) and varying levels of risk reduction actions:

- Alternative 1: No Action Indicated (NAI)
- Alternative 2: Institutional Controls
- Alternative 3: Surface Clearance of OE
- Alternative 4: Subsurface Clearance of OE to Depth of Detection.

1.3 EE/CA PROJECT TEAM

Figure 1-2 presents a project organization chart that illustrates how specific individuals and/or organizations interacted with each other throughout the project.

1.3.1 U.S. Army Engineering and Support Center, Huntsville, and U.S. Army Corps of Engineers, Honolulu District

The USACE has been tasked to evaluate and determine the necessity of OE risk reduction actions for all Formerly Used Defense Sites (FUDS). The CEHNC and the CEPOH are the sponsors of the EE/CA for the Former Waikoloa Maneuver Area and Nansay Sites. The CEHNC has final approval over the EE/CA.

The following consultants were under contract to the CEPOH during the Phase II EE/CA field investigation.

Archaeological Subcontractor. The Project Archaeologist (AMEC Earth and Environmental) was responsible for monitoring the EE/CA field activities to ensure that cultural resources and archaeological sites were not disturbed.

Biological Subcontractor. The Project Biologist (Palmer and Associates Consulting [PAC]) was responsible for monitoring the EE/CA field activities to ensure that biological resources were not disturbed.

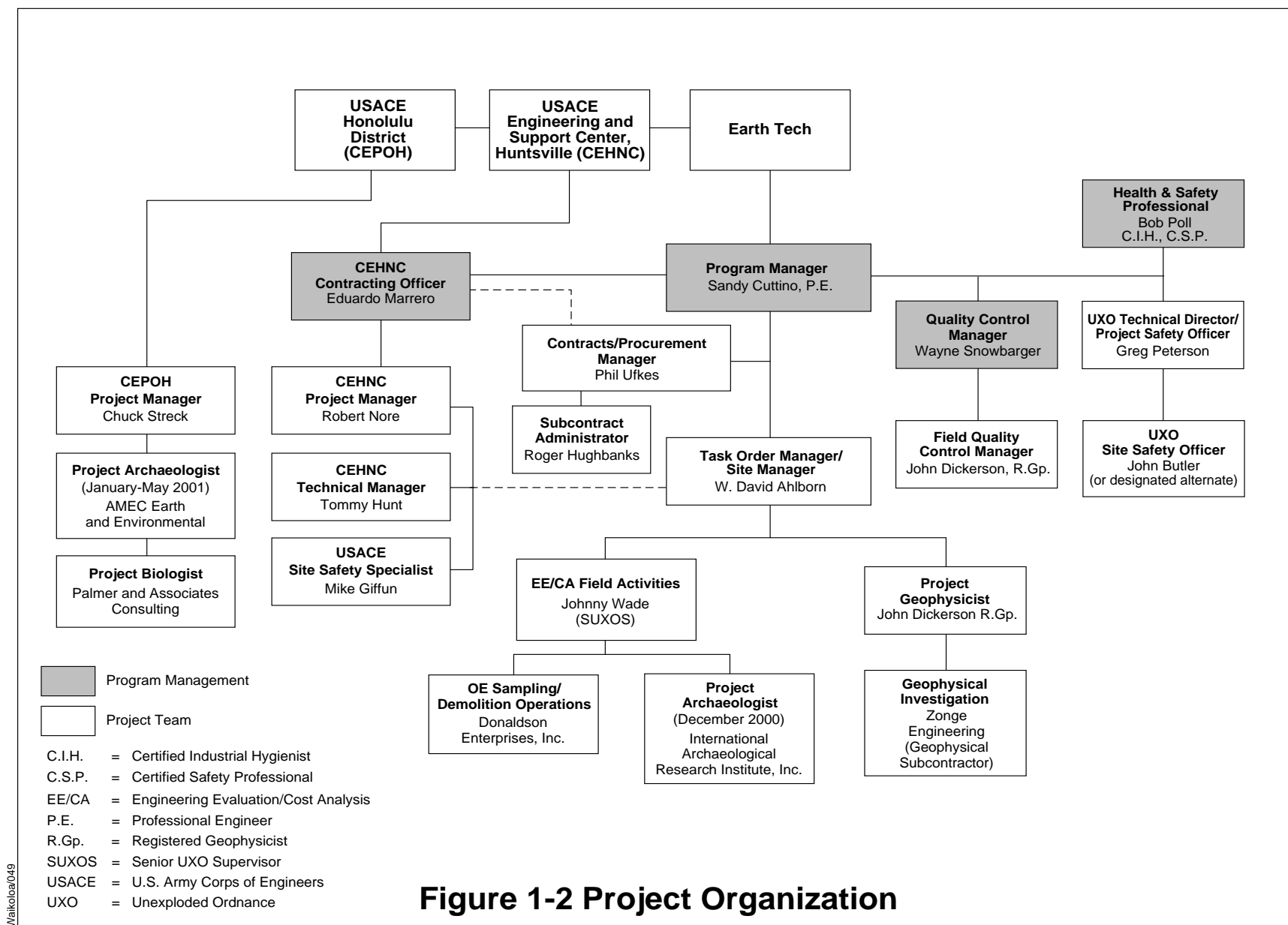
1.3.2 Earth Tech

Program Manager. The Program Manager was responsible for monitoring the overall progress of the Task Order, reviewing monthly progress reports, and ensuring that Earth Tech's resources were available to the Task Order Manager. The Program Manager maintained close communication with the CEHNC to assess client satisfaction with Earth Tech's performance on this Task Order. The Program Manager is the Principal Engineer in Charge and has approved this Final EE/CA report.

Task Order Manager. The Task Order Manager was responsible for the management of all project activities. The Task Order Manager monitored staff performance, resolved problems, prepared monthly cost/progress reports, and verified that Task Order requirements were being met to the quality expectations of the CEHNC.

Quality Control Manager. The Quality Control (QC) Manager was responsible for reviewing and updating the QC Plan and verifying compliance with the plan. Compliance is verified through audits of project activities by the QC Manager, who has the authority to require corrective actions to ensure compliance with the QC Plan.

Health and Safety Professional. The Health and Safety Professional developed and coordinated the Site-Specific Safety and Health Plan (SSHP).



The Health and Safety Professional is the contact for regulatory agencies on matters of health and safety.

Project Safety Officer. The Project Safety Officer performed the routine duties for health and safety, with the assistance of the designated Health and Safety Professional.

Unexploded Ordnance Site Safety Officer. The Unexploded Ordnance Site Safety Officer (UXOSSO) was responsible for implementing and enforcing the safety and health requirements during the Phase II EE/CA field investigation. The Project UXOSSO administered the SSHP.

Senior Unexploded Ordnance Supervisor. The Senior UXO Supervisor (SUXOS) directed on-site personnel and equipment to safely conduct OE-related field activities during the Phase II EE/CA field investigation.

Project Archaeologist. The Earth Tech Project Archaeologist (International Archaeological Research Institute, Inc. [IARI]) was responsible for monitoring EE/CA field activities to ensure that cultural resources and archaeological sites were not disturbed.

Project Geophysicist. The Project Geophysicist provided oversight and direction for all geophysical activities in support of the EE/CA. The Project Geophysicist, or designee, interfaced directly with the CEHNC and the geophysical subcontractor regarding the quality and interpretation of the geophysical data collected.

Geophysical Subcontractor. The geophysical subcontractor provided support for the geophysical mapping phase of the Phase II EE/CA field investigation and performed the following tasks:

- Collected geophysical data, identified anomalies, and marked locations of anomalies to be investigated
- Provided consultation relative to the conduct of the field investigation and resolved questions/problems relating to the proper function of the geophysical instrumentation used
- Performed field data quality control, including oversight of data downloading, field survey documentation, and data tracking.

1.4 EE/CA OBJECTIVES

The objective of the EE/CA is to support an informed decision for determining the most appropriate OE response action(s) for the site.

The objective of the EE/CA for the Former Waikoloa Maneuver Area and Nansay Sites has been accomplished by: (1) conducting geophysical surveys to detect and map anomaly sources and intrusively investigating these anomaly sources to identify the type and depth of any OE present; (2) determining the amount and

depth to which OE may be removed in order to reduce the risk associated with OE at the Former Waikoloa Maneuver Area and Nansay Sites, while taking into consideration current and future land use of the property; (3) involvement with the local communities and stakeholders concerning the progress and findings of the Phase II EE/CA investigation; (4) providing the public and local agencies the opportunity to review and comment on the Draft Final EE/CA Report during October and November 2001; and (5) performing an Institutional Analysis (Chapter 5.0) to identify and analyze the institutional framework necessary to support the development of institutional controls as an effective OE response action alternative for the Former Waikoloa Maneuver Area and Nansay Sites.

The level of OE risk associated with the Former Waikoloa Maneuver Area and Nansay Sites was evaluated using a qualitative risk assessment. OE response action alternatives were developed and evaluated based on the results of the qualitative risk assessment in Chapter 4.0, the decision criteria presented in Chapter 7.0, and the evaluation of the four OE response action alternatives in Chapter 8.0.

1.5 EE/CA REPORT FORMAT

This report is organized as follows:

- **Chapter 1.0 - Introduction:** Discusses the purpose and objective of the EE/CA, outlines the EE/CA project team, presents the organization of the EE/CA report, and presents the summary of work performed in support of the EE/CA.
- **Chapter 2.0 - Site Description and History:** Provides the following information concerning the Former Waikoloa Maneuver Area and Nansay Sites:
 - History and the types of ordnance reported to have been used at the site
 - Overview of all potential OE sites
 - General discussion of the current status and existing facilities
 - Description of the natural features of the site (e.g., geology, topography, sensitive habitats, cultural resources).
- **Chapter 3.0 - Site Characterization:** Provides a detailed description of EE/CA field activities including: visual reconnaissance, surface clearance, geophysical investigation and mapping, OE sampling, and UXO demolition procedures. This chapter presents the results of the EE/CA field investigation.

- **Chapter 4.0 - Ordnance and Explosives Risk Impact Assessment (OERIA):** Includes a discussion of the risk analysis process, including the qualitative risk evaluation approach and the results of the OERIA conducted for the Former Waikoloa Maneuver Area and Nansay Sites.
- **Chapter 5.0 - Institutional Analysis:** Documents government and local agencies that have jurisdiction over lands within the project area and assesses their capability and willingness to assert controls that would protect the public from explosive hazards.
- **Chapter 6.0 - Identification of EE/CA Response Action Objectives:** Presents the process used to identify OE response action alternatives evaluated in this EE/CA report.
- **Chapter 7.0 - Identification of Response Action Alternatives and Evaluation Criteria:** Presents the OE response action alternatives considered in this EE/CA report and a discussion of the evaluation criteria for each alternative.
- **Chapter 8.0 - Comparative Analysis of OE Response Action Alternatives:** Discusses the applicability of the various alternatives in terms of their effectiveness, implementability, and cost.
- **Chapter 9.0 - Recommended OE Response Action Alternatives:** Presents the recommended OE response actions (including estimated costs) for the Former Waikoloa Maneuver Area and Nansay Sites.
- **Chapter 10.0 - EE/CA Follow-on Activities and Recurring Reviews:** Presents the recommendations for residual risk management activities and EE/CA follow-on activities for the Former Waikoloa Maneuver Area and Nansay Sites.
- **Chapter 11.0 - References:** Provides an inventory of the reference material used in the preparation of this EE/CA report.
- **Chapter 12.0 - Glossary of Terms and Acronyms/Abbreviations:** Provides a detailed list of terms used throughout this EE/CA report. For each term, a detailed and complete definition is provided. A list of acronyms and abbreviations is also included for reference.
- **Chapter 13.0 - List of Preparers:** Includes a list of personnel who contributed to the preparation of this EE/CA report.
- **Appendix A - EE/CA Contractor Scope of Work:** Includes the scope of work (SOW) for Earth Tech.
- **Appendix B - Equipment Field Test Letter Report:** Provides the letter report documenting the results of the geophysical equipment field tests.

- **Appendix C - Geophysical Quality Assurance Summary Report:** Provides the quality assurance review summary report by the CEHNC of the geophysical data collected during the Phase II EE/CA field investigation.
- **Appendix D - OE Investigation Results:** Provides a detailed list of the types of ordnance recovered in each sector and grid during the Phase II EE/CA field investigation.
- **Appendix E - OE Scrap Turn-In and Explosives Accountability Documentation:** Provides documentation of the turn-in of all OE scrap recovered during the Phase II EE/CA field investigation.
- **Appendix F - Summary of Interviews Conducted in Support of the Institutional Analysis:** Includes interviews conducted in support of the Institutional Analysis.
- **Appendix G - UXO Calculator Results:** Provides a data output showing the preliminary sampling acreages that were used as a guideline during the Phase II EE/CA field investigation. The UXO Calculator is a CEHNC-designed computer-based model used to calculate statistical conclusions at FUDS.
- **Appendix H - Cost Estimate Data:** Provides the costs associated with the OE response action alternatives evaluated and recommended in this EE/CA report.

1.6 WORK PERFORMED

Work on this project was performed in accordance with the Master Work Plan (Earth Tech, 1997a) and the Master Work Plan Addendum (Earth Tech, 2000b) prepared for the EE/CA investigation at the Former Waikoloa Maneuver Area and Nansay Sites, as required by the SOW, Task Order 0029, Contract No. DACA87-95-D-0017, which is provided as Appendix A. The EE/CA process is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). The work performed in support of this EE/CA is described in the following sections.

1.6.1 Site Visit and Records Review

Earth Tech conducted a site visit from 8-10 March 1999. The purpose of the trip was to gather information necessary to develop an executable addendum to the Master Work Plan (Earth Tech, 1997a). This task included meeting with the CEHNC and CEPOH project and technical managers and representatives of the Parker Ranch, the Waimea (Kamuela) Police Department, and the County of Hawai'i Civil Defense Department. The site visit team toured several areas of the former maneuver area where UXO and OE scrap had been reported to the CEPOH and the Waimea Police Department. Existing data related to OE at the

Former Waikoloa Maneuver Area and Nansay Sites, including the investigation results from the Phase I EE/CA, were reviewed by the site visit team.

1.6.2 EE/CA Reconnaissance and Site Prioritization Report

An EE/CA Reconnaissance and Site Prioritization Report was prepared by Earth Tech (Earth Tech, 2000a) to establish investigation areas (i.e., sectors) for the Phase II EE/CA field investigation at the Former Waikoloa Maneuver Area and Nansay Sites. The project site was divided into 13 sectors based on past, current, and future land use; land ownership or administration; and/or prominent geographic features that would enable field personnel to identify specific sector boundaries in the field. Sectorization of the project site was also performed to assist in determining and managing subsequent geophysical mapping and OE sampling activities. Details concerning each of the 13 sectors is presented in Section 2.2.2, Investigation Areas within the Former Waikoloa Maneuver Area and Nansay Sites.

1.6.3 Geophysical Test Plot

An equipment field test was conducted to verify that the recommended geophysical mapping methodology and approach for detection of subsurface OE at the former maneuver area were appropriate for the areas to be investigated during the EE/CA. The test bed consisted of inert OE items buried at depths varying from 0 to 46 inches below ground surface (bgs). The results of the field test were documented in a letter report to the CEHNC Project Manager, provided as Appendix B.

1.6.4 Preparation of the Project Work Plan Addendum

The Master Work Plan (Phase I EE/CA) and the Master Work Plan Addendum (Phase II EE/CA) are the guide for all EE/CA-related activities, including geophysical mapping, OE investigations, and all work within the Former Waikoloa Maneuver Area and Nansay Sites. The Master Work Plan Addendum addresses specific acreage to be geophysically and intrusively investigated and the site-specific approach to the Phase II EE/CA field investigation.

1.6.5 Location Surveys and Mapping

In November and December 2000, the boundaries of grids (i.e., areas to be geophysically mapped and intrusively investigated) were established in areas known to contain ordnance. Additional grids were placed throughout the EE/CA field investigation to further characterize the site for the presence of OE. In areas where the presence and/or location of ordnance was suspected, random geophysical transects were traversed throughout each investigation area.

1.6.6 Establishment and Management of GIS

Mapping data were based on existing United States Geological Survey (USGS) topographic maps (1:24,000 scale) and existing Geographic Information System (GIS) data available from the state of Hawai'i; these were compared to Global Positioning System (GPS) data collected in the field. Daily digital data were

incorporated into the GIS (i.e., mapped transects and anomalies) as field activities were completed. The GIS was used to guide the daily geophysical investigation and to compile the daily digital data.

1.6.7 Site Investigation and Sampling

Visual Reconnaissance Surveys. Visual reconnaissance surveys were conducted during November and December 2000. Record searches and the results of the EE/CA Reconnaissance and Site Prioritization Report (Earth Tech, 2000) identified these areas to have little or no military activity conducted on them. The visual reconnaissance surveys were performed in an attempt to determine which of these areas would require investigation by means of geophysical mapping and OE sampling. OE-related items recovered during this effort were documented and included in the OERIA (Chapter 4.0).

Surface Preparation, OE Identification, and Removal. Prior to geophysical mapping, surface OE, OE scrap, and non-OE metallic debris were removed from sampling grids and geophysical transect lines to reduce unnecessary surface targets during the geophysical mapping phase. UXO and OE scrap recovered during this effort were documented and included in the OERIA (Chapter 4.0).

Geophysical Investigation and Evaluation. Geophysical mapping was conducted from January to April 2001. Transient electromagnetic (TEM) metal detectors equipped with data recorders and a GPS were used to detect and map the locations of subsurface geophysical anomaly sources and to record the geophysical character of each grid or transect. Using these data, dig sheets indicating the grid or transect number, the anomaly identification number, global coordinates (in Hawai'i State Plane coordinates), geophysical signal magnitude, and the estimated depths of each target anomaly within the grid or transect, were generated.

The quality assurance review by the CEHNC of the geophysical data collected during the Phase II EE/CA field investigation is provided as a summary report in Appendix C.

Visual Surface Search Transects. Portions of the Phase II EE/CA investigation area, where geophysical mapping could not be safely or feasibly performed (due to unstable or densely vegetated terrain), were investigated through a visual surface search conducted by a team of UXO-qualified personnel, using standard OE surface clearance methodologies. The team progressed in a uniform line with a set spacing of 5 feet between each UXO technician. The UXO Supervisor recorded real time locations of the traverse and the position of any discovered OE. OE-related items recovered during this effort were documented and included in the OERIA (Chapter 4.0).

Intrusive Investigation (OE Sampling). OE sampling activities for the Former Waikoloa Maneuver Area and Nansay Sites were initiated in February 2001 and concluded in April 2001. Using the dig sheets generated for each grid or transect, the reacquisition team navigated to each identified anomaly location and marked the anomaly center for recovery and investigation by the OE sampling teams.

Each target anomaly location was confirmed by a geophysical instrument prior to excavation of the suspected anomaly. OE sampling teams then excavated and searched for the source of each of the target anomalies. OE-related items recovered during this effort were documented and included in the OERIA. The results of the OE investigation at the Former Waikoloa Maneuver Area and Nansay Sites are provided as Appendix D.

Disposal of OE scrap was coordinated with a scrap metal recycling facility as required to ensure that inert OE-related scrap was handled in accordance with applicable regulations and procedures. OE scrap turn-in documentation is provided as Appendix E.

1.6.8 Archaeological Survey

Archaeological monitoring and survey activities were performed by IARII and AMEC Earth and Environmental (formerly Ogden Environmental and Energy Services Co., Inc.), both located in Honolulu, Hawai'i. Project archaeologists from IARII and AMEC Earth and Environmental provided awareness training to all personnel involved with the EE/CA field activities. This training included identification and avoidance of archeological resources. IARII provided field monitoring support during the grid establishment and visual reconnaissance surveys to ensure that archaeological and historic sites were not disturbed. AMEC Earth and Environmental provided field support during the surface clearance, geophysical mapping, and OE sampling efforts to ensure that archaeological and historic sites were not disturbed.

1.6.9 Flora and Fauna Survey

Flora and fauna surveys were conducted by PAC. Biologists from PAC provided awareness training to all personnel involved with the Phase II EE/CA field investigation, including identification of areas of concern and specific flora and fauna to be protected during EE/CA field activities. Field personnel were provided with maps that identified important habitats of the species to be protected.

1.6.10 Preparation of Institutional Analysis Report

An Institutional Analysis Report (Chapter 5.0) was prepared to support development of alternative plans of action regarding the use of institutional controls. Data were collected from various sources, including: site visits, government records research, and interviews with local agencies and landowners (Appendix F) with interest in the Former Waikoloa Maneuver Area and Nansay Sites. Interview and survey processes identified jurisdictional boundaries, authorities, responsibilities for land use and public safety, capabilities, resources, and local agencies' willingness to participate in the implementation/utilization of institutional controls.

1.6.11 Risk Evaluation

Using a qualitative risk analysis, the risk that OE presents to the public at the Former Waikoloa Maneuver Area and Nansay Sites was evaluated based on the

results of statistical sampling (Chapter 4.0). A data output report is provided in Appendix G showing how initial sampling acreages were determined using a CEHNC-developed computer-based risk model (UXO Calculator).

1.6.12 Preparation of EE/CA Report

Earth Tech has prepared and submitted this EE/CA report, which fully documents the data collected during the visual reconnaissance, surface clearance, geophysical mapping and OE sampling activities. Earth Tech has used these data, information obtained during the public involvement process (see Section 1.6.14), and data collected in support of the Institutional Analysis (Chapter 5.0) for evaluation of the four OE response action alternatives and recommendations made in this EE/CA report. Estimated costs and costing backup for the recommended OE response actions presented in this EE/CA report are provided as Appendix H.

1.6.13 Preparation of Action Memorandum

An Action Memorandum, documenting the government's decision for the selection of the recommended OE response action(s), will be prepared for the Former Waikoloa Maneuver Area and Nansay Sites.

1.6.14 Community Relations Support

All community relations support was coordinated through the USACE, Honolulu District, who ensures that the community is informed by conducting public meetings and Restoration Advisory Board (RAB) meetings to discuss current activities and the status of the Former Waikoloa Maneuver Area and Nansay Sites.

Earth Tech took an active role in keeping the local community apprised of the status of the Phase II EE/CA field investigation. Earth Tech representatives met with and participated in the following local community meetings: (1) RAB meetings, (2) Waimea Community Association meetings, (3) Department of Hawai'ian Homelands Monthly Association Meeting, and (4) the Parker Ranch Annual Health Fair. On several occasions, Earth Tech representatives provided safety briefings (regarding the types of OE found at the site and the associated hazards) to local police and fire departments and the Navy Seabees (construction battalion). Earth Tech also provided OE demolition notifications to all RAB members, local police and fire departments, local hospitals, and the Federal Aviation Administration (FAA), prior to all UXO disposal activities.

1.6.15 Preparation of Explosives Safety Submission

Following approval of the Final EE/CA report and the Action Memorandum, an Explosives Safety Submission (ESS) will be prepared if NAI or Institutional Controls is the selected OE response action for any area at the Former Waikoloa Maneuver Area and Nansay Sites. The ESS will be submitted for approval to the Department of Defense Explosives Safety Board (DDESB) prior to implementation.